

Physical and numerical modelling of the response of slopes under different rainfalls, inclinations and vegetation conditions

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Summary

We present the results of an experimental and numerical study focused at quantifying the effect of different crucial factors in slope evolution, such as: rainfalls, inclinations and vegetation conditions. To this aim a small-scale slope was constructed in the laboratory and an experimental program was design to understand the slope response under the following conditions: a) different inclinations, obtained through a system of hydraulic pistons; b) different rainfall conditions (in intensity and duration), obtained through an artificial rain simulator; c) presence / absence of a vegetated cover. The first set of tests allowed defining a trend for the percentage of rainfall infiltration within the slope as a function of the steepness. The second set of tests allowed observing the bare slope behaviour at failure; while the third set demonstrated the beneficial effect of a grass carpet. All the laboratory experiments were integrated by numerical simulations, using the SEEP/w FE code for transient infiltration analyses and the SLOPE/w code for stability analyses. The back-analyses, based on the classical Equilibrium Limit Methods, allowed estimating the enhanced shear strength provided by the presence of the roots, relevant in the practice for remedial works based on Soil Bio-Engineering.

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